

## **VDOT Presentation on Congestion Performance Reporting**

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Programmatic Approach to Congestion Management

Definition of Congestion

Types and Causes of Congestion

Best Practices in Congestion Measurement

Measurement Improvement Plan for Next 12 Months

Additional VDOT Initiatives to Manage Congestion

Incident Management	Congestion Management	Emergency Operations	Traveler Information
<ul style="list-style-type: none"> <li>• Safety Service Patrol</li> <li>• CAD Integration</li> <li>• Virginia Operational Information System</li> <li>• Dynamic Message Signs</li> <li>• Highway Advisory Radio</li> <li>• Portable Devices</li> <li>• Regional Incident Coordination</li> </ul>	<ul style="list-style-type: none"> <li>• Congestion measurement</li> <li>• Signal Optimization</li> <li>• Demand Management               <ul style="list-style-type: none"> <li>• -Ridesharing</li> <li>• -Tele-work</li> <li>• -Flextime</li> </ul> </li> <li>• HOV facilities</li> <li>• Support Transit Alternatives</li> <li>• CAD Integration</li> <li>• Dynamic Message Signs</li> <li>• Highway Advisory Radio</li> <li>• Travel Time</li> </ul>	<ul style="list-style-type: none"> <li>• VA Operational Information System</li> <li>• Portable Devices</li> <li>• Evacuation Planning</li> <li>• CAD Integration</li> <li>• Trans. Emergency Operations Center</li> <li>• Continuity of Operations Plan</li> <li>• Security systems</li> </ul>	<ul style="list-style-type: none"> <li>• 511 Virginia</li> <li>• Dynamic Message Signs</li> <li>• TrafficLand</li> <li>• Data Sharing Agreements</li> <li>• Private Sector Information Providers</li> <li>• Highway Advisory Radio</li> </ul>

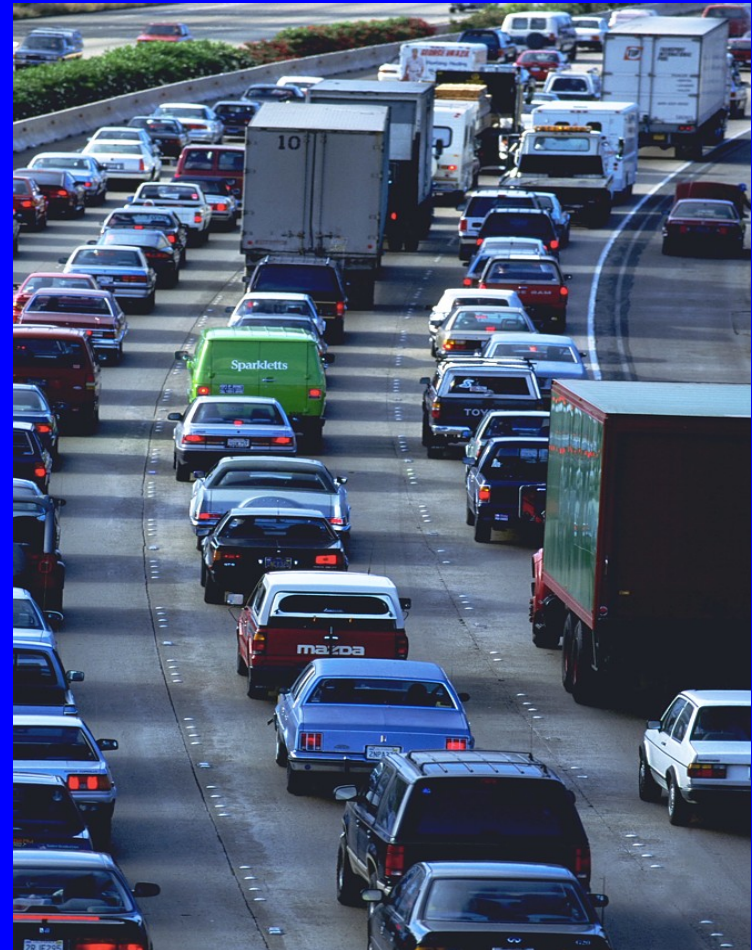
**Congestion:** When volume exceeds capacity and travel speeds drop significantly lower than posted or free flow speed

## Moderate Congestion

- Average travel speed < 50 mph (freeways)
- Average travel speed < 75% of free flow speed
- Actual/free flow travel time > 1.5
- Level of Service D or E

## Heavy Congestion

- Average travel speed < 30 mph (freeways)
- Average travel speed < 45% of free flow speed
- Actual/free flow travel time > 2.0
- Level of Service F



## Recurring Delay

Excess demand caused by normal heavy AM peak, PM peak, and weekend traffic volumes, bottlenecks, or poor signal timing (40%)

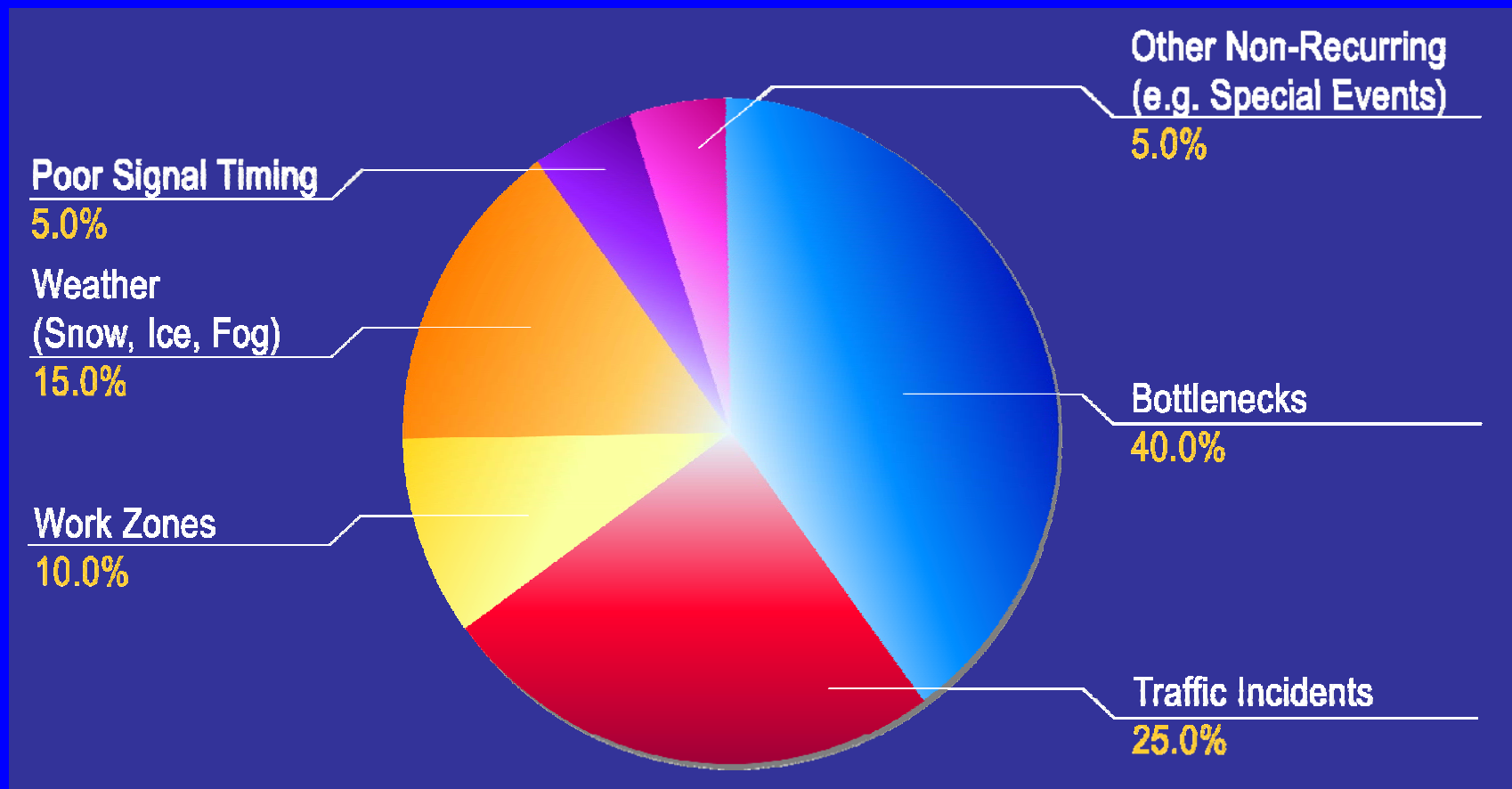


## Non-Recurring Delay

Unexpected or non-recurring restriction in traffic flow caused by incidents, weather, special events or work zones (60%)



# Sources of Congestion



Source: "Traffic Congestion and Reliability;" FHWA (September, 2005)

## Factors Contributing to Extreme Congestion

Traffic-Influencing Event Present			
	High Demand	Bad Weather	Incident
Day 1		▲	
Day 2	▲	▲	▲
Day 3		▲	
Day 4	▲		
Day 5			▲
Day 6	▲	▲	
Day 7	▲		▲
Day 8	▲		
Day 9		▲	
Day 10	▲		
	6 Days	5 Days	3 Days

## Identified Sources of Best Practices:

- National Transportation Operations Coalition (NTOC)
- Texas Transportation Institute
- FHWA Performance Measures
- FHWA International Scan on Performance Measurement (2005)
- NCHRP Studies on Congestion Management,
- Benchmarking Performance
- Other states (Minn., Washington State)



## National Transportation Operations Coalition

System Delay	% of system experiencing travel times 30% longer than unconstrained travel time (Spatial Extent of Delay)
Time Delay	% of time travel times are 30% longer than unconstrained travel time (Temporal Extent of Congestion)
Travel Time	Average minutes per trip required to traverse a section of roadway
Travel Time Reliability	Additional travel time minutes needed to ensure travelers will arrive at their destination at or before the intended time 95% of the time
Non-Recurring Delay	Vehicle hours of delay in excess of recurring delay for the current time of day, day of week, and type day
Recurring Delay	Vehicle hours of delay that are repeatable for the current time of day, day of week, and type day

## Texas Transportation Institute 2005 Urban Mobility Report

Congestion – Four levels used to define severity of congestion based on comparison of estimated speed to free flow speed during peak periods

Travel Delay – Extra time spent traveling due to congestion

Next Report – Summer 2007 (new methodology; using 2005 data)

**“In the 13 largest US cities, between 1983 and 2003, drivers spent the equivalent of almost 8 work days each year stuck in traffic.”**

## FHWA International Scan on Best Performance Measures Practices 2005

Japan – Time lost due to congestion

Australia – Delay, Actual-free flow travel speed, Travel time variability

New Zealand - % of urban kilometers meeting LOS target

Principal investigator: Dr. Michael Meyers, University of Georgia

Commission Douglas McDonald, WashDOT, chair

Dr. T. Jeff Price, **VDOT** Operations Planning

NCHRP (National Cooperative Highway Research Program)

Multiple Studies on Congestion, Performance Measurement

Study on Congestion Measures Project 8-36

Delay

Congestion index

Reliability index

Travel time

Cost of delay and crashes

Transit mode share

% Increase in transit riders

- Data Sources and Data Availability
- Current measurement capabilities
- VDOT Dashboard - Congestion Measures under development for deployment this summer
- Future measurement improvements underway

- VDOT data devices
- Multiple resource and data sharing agreements with private sector companies
- TrafficLand agreement for camera coverage
- UVA Smart Travel Lab currently retesting cell probe technology reliability
- Vehicle to Infrastructure Interface (VII) communications under study for applications

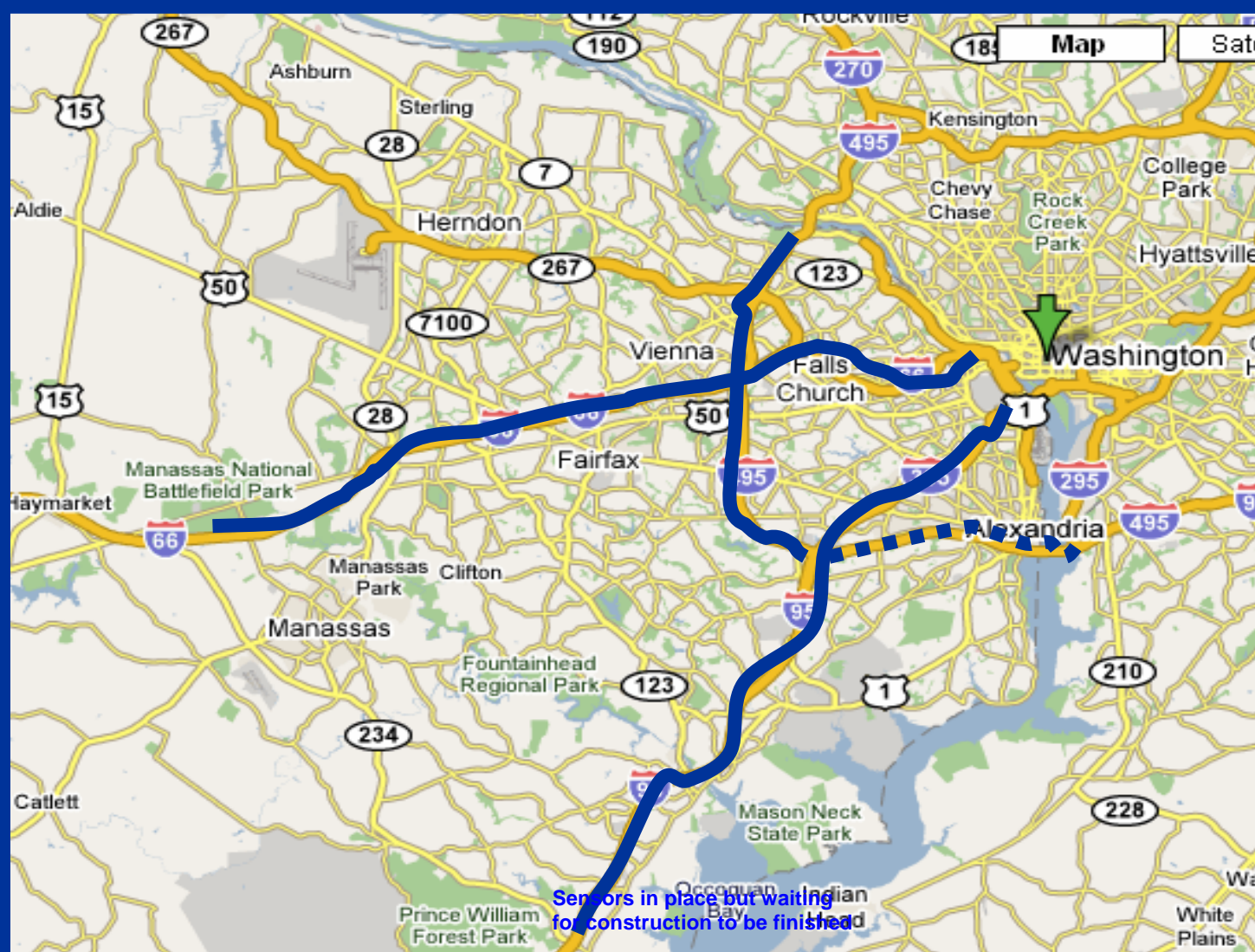
## **Fixed point detectors**

- Embedded single loops (do not provide speed data)
- Embedded trap pair loops
- Side fired radar
- Passive acoustic detectors
- Digital video
- Continuous count stations (trap pair loops plus axle detector)

## **Moving probes**

- portable detector units
- Cell phones
- Toll tag readers
- License plate readers
- GPS enabled vehicles

# Current NOVA Freeway Loop Detector Coverage



## TODAY

### NOVA

- 774 single induction loop detectors
- 440 trap induction loop pairs
- 20 side fired radar
- 12 passive acoustic detectors
- 59 continuous count stations

### Hampton Roads

- 147 trap induction loop pairs
- 493 single induction loop detectors
- 196 side fired radar
- 86 continuous count stations

### Other Locations

- 182 continuous count stations statewide

## July 2008

### NOVA

- 278 single loop detectors
- 326 trap induction loop pairs
- 85 side fired radar units
- 35 wireless magnetometer
- 12 passive acoustic
- 59 continuous count stations

### Hampton Roads

- 159 side fired radar
- 78 passive acoustic detectors
- 86 continuous count stations

### Other Locations

- 182 continuous count stations statewide



Speed index - Ratio of actual speed to free flow speed

Extent of Congestion -- % of vehicles experiencing LOS A-C (good), D-E (moderate), or F (poor)

Duration of Congestion - % of time traffic experiences LOS A-C (good), D-E (moderate), or F (poor)

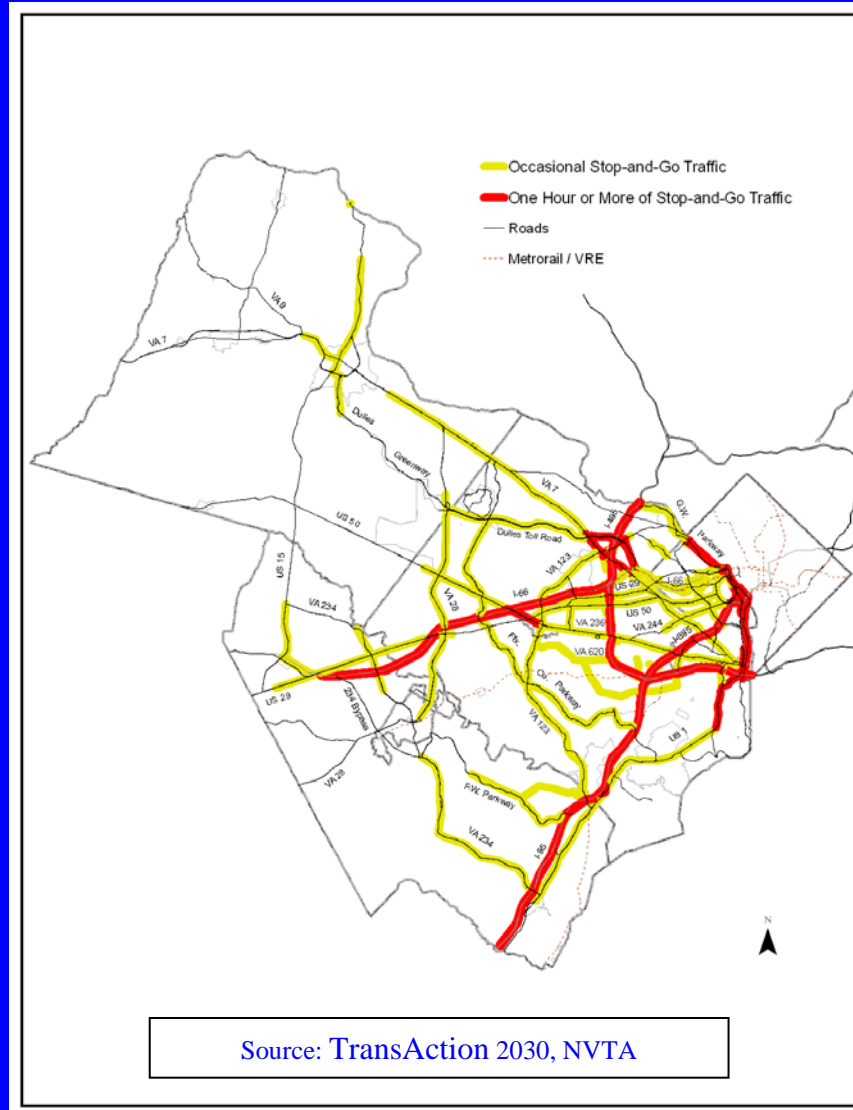
Throughput - Total number of vehicles, Total number of people (People throughput on HOV facilities only)

HOV performance - % of time average speed < 45 mph. Will be compared to adjacent general purpose lanes

Average Travel Time - on Key Routes

Measure	Units	Frequency	Scale
Speed index	Ratio	Monthly	Select locations, Statewide avg.
Throughput	Vehicles, People	Quarterly	Select locations, & HOV (people)
Extent of Congestion	% of VMT	Quarterly	Select locations, Statewide avg.
Duration of Congestion	% of time	Quarterly	Select locations, Statewide avg.
Travel Time	Minutes	Quarterly	Select routes
HOV Performance	% of time	Quarterly	HOV facilities

# 2005 Highway System Performance NOVA



## Highway Performance

- Level of Congestion
- HOV Performance - % HOV traffic with speed < 45 mph. vs. conventional lanes traffic with speed < 45 mph.
- HOV vs. conventional - # cars & people moved
- Travel Times – on key commuter routes
- Incident Duration

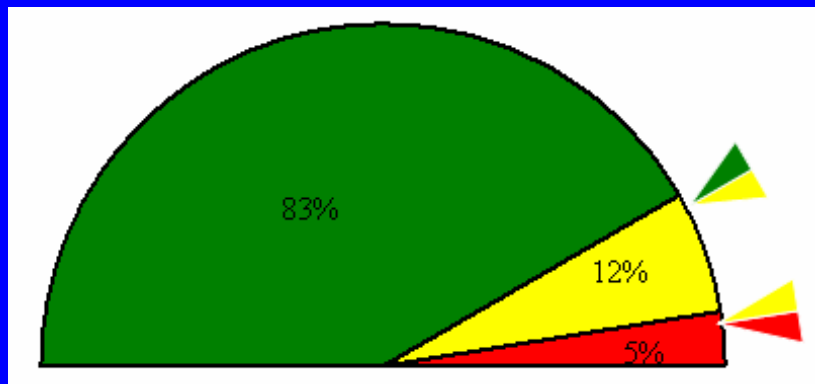
## Safety

- Crashes
- Injuries
- Deaths
- Work Zone Crashes

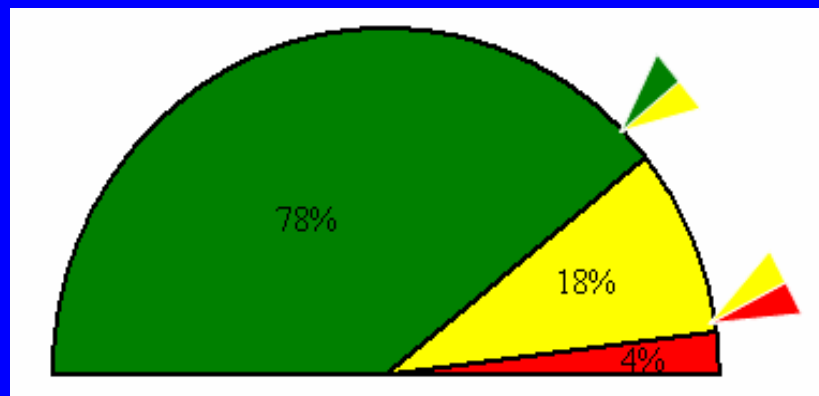
## Interstate System Congestion

- Use vehicle density – HCM Level of Service (LOS) measure
- Display % of VMT at:
  - Good (Los A – C)
  - Marginal (Los D – E)
  - Poor (Los F)
- Display data by:
  - Statewide
  - Urban
  - Suburban
  - Rural

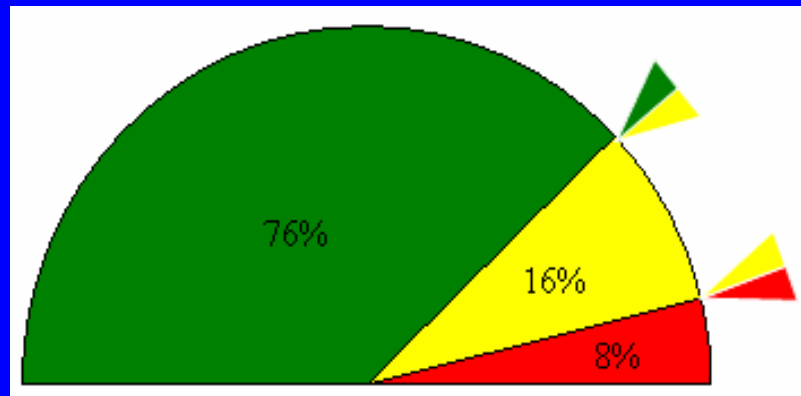
# DRAFT - Statewide Extent of Congestion by LOS



(24 hours)



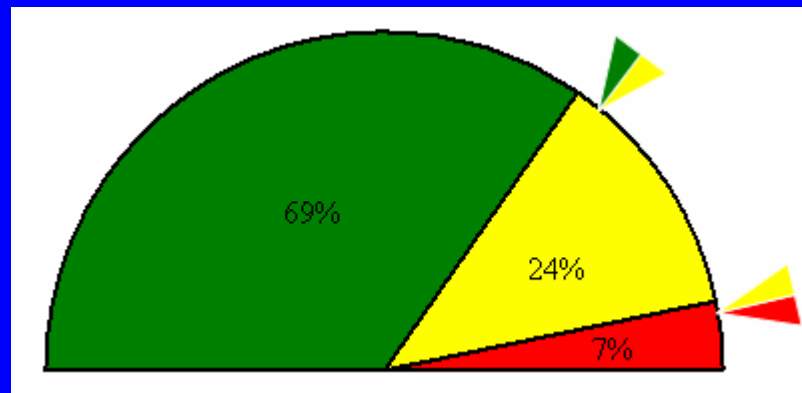
(AM Peak)



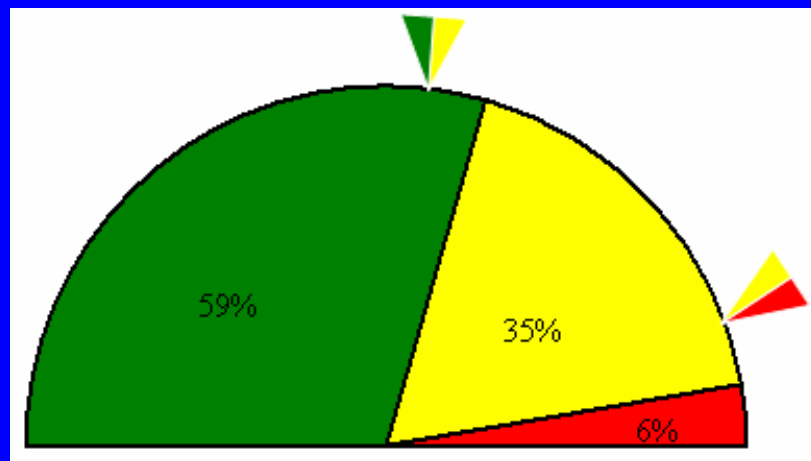
(PM Peak)

**March 30, 2007 Draft**  
(not yet weighted by VMT)

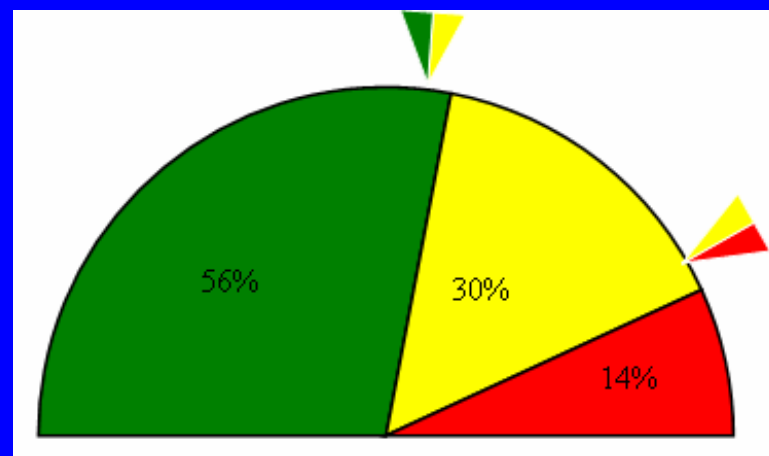
# DRAFT Urban Congestion based on LOS



(24 hours)



(AM Peak)



(PM Peak)

**March 30, 2007 Draft  
(not yet weighted by VMT)**

- Redesign detector system (detector locations, etc.) for congestion and travel time measurement
- Assess costs for VDOT detector system, including purchase of traffic data from private vendors
- Procure and install new detectors
- Remove, repair and upgrade detectors, as needed
- Integrate new detectors into statewide traffic data archive
- Develop requirements for analysis and performance reporting tools
- Initiate plans to monitor and maintain detector functionality



## Congestion reporting:

As STC detector reliability improves and new detectors come on line, data points for reporting in NOVA and Hampton Roads will be added to performance calculations

## Travel time key routes:

### NOVA

I-66

I-95

I-395

### Hampton Roads

I-64

# Additional Efforts To Improve Congestion Management Capability

- Replace current NOVA Smart Traffic Center with an Advanced Transportation Management System with an integrated system.
- Upgrade/replace/refurbish freeway technology infrastructure
- Add technology for measuring major arterial corridor congestion
- Provide *integrated* solutions for freeway and arterial management to include travel decision points
- Expand information to public of:
  - Frequent accident locations
  - Recurring congestion locations
  - Accurate and reliable travel time / traffic information on major corridors
- Research and plan deployment for next generation traffic signal systems and other technology applications such as VII

## Questions

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